

## What is claimed is:

1. An apparatus capable of making optimal differential and single-ended measurement interfaces, comprising:
  - 5 a first summation element operable to receive a first input to be measured and a first final offset voltage input, wherein a first summation element output is the algebraic sum of the first input and the first final offset voltage input;
  - 10 a second summation element operable to receive a second input to be measured and a second final offset voltage input, wherein a second summation element output is the algebraic sum of the second input and the second final offset voltage input;
  - 15 a first switch operable to receive a first offset voltage and to enable and disable the first final offset voltage;
  - 20 a second switch operable to receive a second offset voltage and to enable and disable the second final offset;
  - 25 a differential amplifier operable to receive first and second summation element outputs as differential inputs, having a differential amplifier output which is determined by the difference between the differential inputs;
  - 30 a third summation element operable to receive the differential amplifier output signal and a third final offset voltage as inputs, and produce a third summation element output which is the algebraic sum of the differential amplifier output signal and the third final offset voltage; and
  - 35 a third switch operable to receive a third offset voltage and to enable and disable the third final offset voltage.
2. The apparatus of claim 1 wherein the first switch is controllable manually, or digitally locally, or digitally external to the apparatus.
3. The apparatus of claim 1 wherein the second switch is controllable manually, or digitally locally, or digitally external to the apparatus.

4. The apparatus of claim 1 wherein the third switch is controllable manually, or digitally locally, or digitally external to the apparatus.
5. The apparatus of claim 1 wherein the first offset voltage is derived using analog or digital techniques.
6. The apparatus of claim 1 wherein the second offset voltage is derived using analog or digital techniques.
7. The apparatus of claim 1 wherein the third offset voltage is derived using analog or digital techniques.
8. The apparatus of claim 1 wherein the first summation element output comprises a voltage or a current.
9. The apparatus of claim 1 wherein the second summation element output comprises a voltage or a current.
10. The apparatus of claim 1 wherein the third summation element output comprises a voltage or a current.
11. The apparatus of claim 1 wherein one or more of the first summation element, the second summation element, the third summation element, the first switch, the second switch, the third switch, and/or the differential amplifier are implemented using analog techniques or software techniques.

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12. The apparatus of claim 1 wherein the apparatus is mounted in a probe.

13. A system capable of making optimal differential and single-ended measurement interfaces, comprising:

- a first summation element operable to receive a first input to be measured and a first final offset voltage input, wherein a first summation element output is the algebraic sum of the first input and the first final offset voltage input;
- 5 a second summation element operable to receive a second input to be measured and a second final offset voltage input, wherein a second summation element output is the algebraic sum of the second input and the second final offset voltage input;
- 10 a first switch operable to receive a first offset voltage and to enable and disable the first final offset voltage;
- a second switch operable to receive a second offset voltage and to enable and disable the second final offset;
- 15 a differential amplifier operable to receive first and second summation element outputs as differential inputs, having a differential amplifier output which is determined by the difference between the differential inputs;
- a third summation element operable to receive the differential amplifier output signal and a third final offset voltage as inputs, and produce a third summation element output which is the algebraic sum of the differential amplifier output signal and the third final offset voltage;
- 20 a third switch operable to receive an offset voltage and to enable and disable a third final offset voltage; and
- control of the first switch, the second switch, the third switch, the first offset, the second offset, or the third offset which is applied from a source or sources external to the apparatus.

14. The apparatus of claim 13 wherein said control is generated by sources within the probe.

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15. The apparatus of claim 13 wherein said control is generated by sources external to the probe.

16. A method of optimizing single-ended and differential inputs received by the measurement interface, comprising:

selectively modifying offset from a first input;

selectively modifying offset from a second input;

5 generating the algebraic difference of the first and second inputs after offset has been selectively modified from said first and second inputs; and

adjusting a final output offset to nullify a differential amplifier offset or to establish a desired DC output component on an output of the measurement interface.

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17. The method of claim 16, further comprising:

enabling a first switch to allow variability of a first final offset;

disabling a second switch to force a zero value for a second final offset;

disabling a third switch to force a third final offset to zero; and

5 adjusting a first offset voltage to produce zero static DC level of the output.

18. The method of claim 16, further comprising:

enabling a first switch to allow variability of a first final offset;

disabling a second switch to force zero for a second final offset;

enabling a third switch to allow variability of a third final offset;

5 adjusting a first offset voltage for zero offset at a first differential amplifier input; and

adjusting a third offset voltage to null the differential amplifier offset or to establish an output DC offset of the output.

19. The method of claim 16, further comprising:

enabling a first switch to allow variability of a first final offset;

enabling a second switch to allow variability of a second final offset;

disabling a third switch to force a third final offset to zero;

5       adjusting a first offset voltage for zero offset at a first differential amplifier input; and  
          adjusting a second offset voltage for zero offset at a second differential amplifier input.

20.   The method of claim 16, further comprising:  
          enabling a first switch to allow variability of a first final offset;  
          enabling a second switch to allow variability of a second final offset;  
          enabling a third switch to allow variability of a third final offset;  
5       adjusting a first offset voltage for zero offset of a first differential amplifier input;  
          adjusting a second offset voltage for zero offset of a second differential amplifier input; and  
          adjusting a third offset voltage to null the differential amplifier offset or  
10      to establish an output DC offset of the output.

21.   The method of claim 16, further comprising:  
          disabling a first switch to force a first final offset to zero;  
          enabling a second switch to allow variability of a second final offset;  
          enabling a third switch to allow variability of a third final offset;  
5       adjusting a second offset voltage for zero offset at a differential amplifier input; and  
          adjusting a third offset voltage to null a differential amplifier offset or to establish an output DC offset of the output.

22.   The method of claim 16, further comprising:  
          disabling a first switch to force a first final offset to zero;  
          disabling a second switch to force a second final offset to zero;  
          enabling a third switch to allow variability of a third final offset; and  
5       adjusting a third offset voltage to null the differential amplifier offset or to establish an output DC offset of the output.

23. The method of claim 16, further comprising:
  - disabling a first switch to force a first final offset to zero;
  - disabling a second switch to force a second final offset to zero; and
  - disabling a third switch to force a third final offset to zero; and
- 5 performing measurements without signal offset modifications by the measurement interface.

  

24. The method of claim 16, further comprising:
  - disabling a first switch to force a first final offset to zero;
  - enabling a second switch to allow variability of a second final offset;
  - disabling a third switch to force a third final offset to zero; and
- 5 adjusting a second offset voltage for zero offset of a differential amplifier input.

25. An apparatus operable to receive and operate on first and second inputs of a measurement interface, comprising:

- first means for selectively modifying offset from the first input;
- second means for selectively modifying offset from the second input;
- 5 means for generating the algebraic difference of first and second inputs after offset has been selectively removed from each; and
- third means for selectively modifying a final output offset of an output.

26. A measurement interface capable of optimizing single-ended and differential inputs received by the measurement interface, comprising:

- a first summation element operable to selectively modify offset from a first input and generate a first summation element output;
- 5 a second summation element operable to selectively modify offset from a second input and generate a second summation element output; and
- a difference element that receives the first and second summation element outputs and generates the difference between said first and second summation element outputs at an output of the difference element.

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27. The interface of claim 26, wherein the difference element is a differential amplifier.

28. The interface of claim 26, further comprising:

- a third summation element operable to selectively modify offset from the output.